

project WEB

Spring
2007

Connecting Projects WILD, WET and Learning Tree in New Hampshire

Stories of N.H. are Written Throughout its Forests

Merriam-Webster's Dictionary defines being literate as "having knowledge or competence." In this issue of the WEB, we are asking our educators to become forest literate – to gain the ability to recognize and understand the stories conveyed by watching, listening and, above all, exploring the forested landscape.

Why did this tree fall? What are those markings on that old log? Who left that footprint in the mud? Why is there mud here? What just made that noise? When you walk through the forest, you may have asked some of these same questions, and that is

exactly how learning about forest stories begins! Remember that there can be many characters to include in these stories, and it is fascinating to wonder about and investigate all of them that you can find.

The following articles were chosen to address some of the more common "stories" and "characters" hidden in many of New Hampshire's forests. We hope that as you become familiar with your own local forested area, your eyes will open to the story that it tells and allow you to share this story with your students and community.



IN THIS ISSUE

Forest Mysteries	2
Related Activities	2
Spotlight on Bear Brook SP	3
Boulders	4
Track and Sign	5
Announcements	6
Project HOME	7

Reading...While Hiking

by Dave Anderson for NH Project Learning Tree

*"I frequently tramped
8 or 10 miles through
the deepest snow to
keep an appointment
with a beech tree,
or a yellow birch,
or an old acquaintance
among the pines."
- Henry David Thoreau*

Walking in the woods near your home, have you noticed that certain types of trees tend to grow in particular places? Have you ever seen an abrupt change in a forest along your favorite hiking trail and wondered why?

Imagine a trail crossing a sunny, oak hillside carpeted with acorns and fallen leaves and suddenly descending steeply into a cool, shadowy hemlock woods along a brook, then emerging to trace the wetland edge of a red maple swamp before crossing a stone wall into a pure stand of white pines. These patterns tend to repeat in similar places across the New Hampshire landscape. As one place begins to remind you of another place you've been, you become a forest detective, reading changes in woods while searching for clues that can tell you why.

Perhaps you're not entirely sure what to look for, or what the different types of trees are saying about

© GEOFF JONES / COURTESY OF THE FOREST SOCIETY



Looking at the palette of colors in the spring can tell you a lot about the forested landscape.

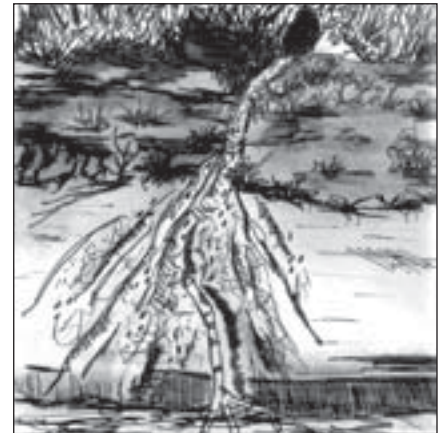
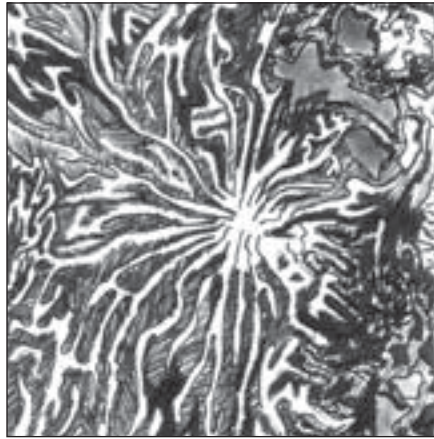
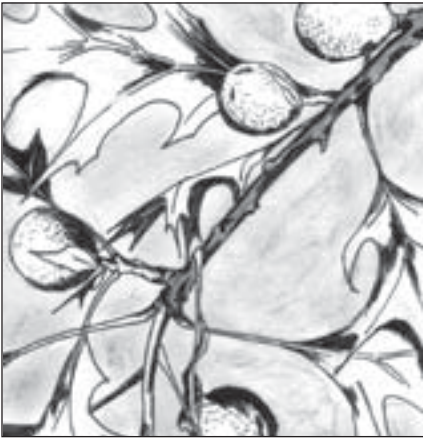


© 2007
New Hampshire
Fish and Game
Department

READING continued on page 3

1-Minute Forest Mysteries!

Can you guess what these stories of the forest are telling?



Answers can be found on page 5

Activities Related to Articles in This Issue

Project Learning Tree suggests:

In *Tree Cookies*, students will correlate the time it takes a tree to grow with events in human history while they examine cross-sections of trees and look for patterns of change.

In *Trees in Trouble*, students will examine trees for signs of damage and poor health that lead to questions about forest health. They will also investigate possible causes of unhealthy plants through a series of experiments.

In *Nothing Succeeds Like Succession*, students explore the connection between plants, animals and successional stages in a local ecosystem.

Project WILD suggests:

Students use worksheet maps in *Changing the Land* to study fragmentation, and use aerial photographs to examine changes in land use and to evaluate how those changes affect ecosystems.

In *Learning to Look, Looking to See*, students practice their observation skills in a familiar indoor setting, before moving outdoors to apply those experiences and new skills to an unfamiliar setting.

Students go outside in *Habitrekking* to conduct an investigation requiring observation, interpretation and data-gathering skills. They then prepare and present their findings to classmates.

Project WET suggests:

By mapping and analyzing where water flows over the schoolyard in *Rainy Day Hike*, students can develop a plan to improve drainage and lessen runoff from their school.

In *Wetland Soils in Living Color*, students learn about the properties of wetland soils and attempt to classify them by creating their own soil color chart with crayons.

The ecological benefits of how wetlands provide flood protection and water storage come alive as students participate in *Capture, Store, and Release*.



Bear Brook State Park

Practice reading the forested landscape at this and other state parks.

Did you know that the largest developed state park in New Hampshire is practically in the backyard for many of us? Just minutes from both Concord and Manchester, the 10,000-acre Bear Brook State Park straddles the towns of Allenstown, Deerfield, Hooksett and Candia. Primarily forested, Bear Brook State Park includes several ponds, two marshes managed to enhance waterfowl habitat, a classic kettle-hole bog, and, of course, the brook from which the park gets its name. Because of the large size of the park and the diversity of ecosystems found there, Bear Brook supports a wide variety of wildlife, including beaver, black bear, moose, deer, raccoon, great blue heron and turkey.

The abundance of wildlife and a history of human interaction with the land and glacial movement in the area make Bear Brook a great place to practice reading the landscape and solving the mysteries of the area, past and present. For example, stone

walls found deep in the forests are a classic clue that the land had once been cleared for farming. Large boulders scattered about, with no large rock faces nearby, are indicative of past glacial movement. Pointy tree stumps near a wetland tell us that beaver have been active in the area; just as a small mound or lodge made of cattails likely indicates that muskrats have been there, too. Wildlife, people and glaciers are just a few of the “characters” that have left clues to their stories behind in Bear Brook State Park. It’s a great place to visit and practice your new forest literacy skills.

Outdoor enthusiasts enjoy swimming, camping in the park’s 80-site campground and fishing in Archery Pond (fly-fishing only), as well as hiking on miles of marked trails in the park. Bear Brook State Park is also home to the New Hampshire Snowmobile Museum, the Museum of Family Camping, the historic Old Allenstown



Wildlife biologist Eric Orff checks a wood duck box at Bear Brook State Park.

Meeting House and the Museum of the Civilian Conservation Corps (CCC). In fact, most of the museums are housed in old CCC buildings, part of the historic Bear Brook CCC Camp that is now on the National Register of Historic Places. Bear Hill 4-H Camp is also located in the park, as well as the site of the former Spruce Pond 4-H Camp, which now serves as the base for N.H. Parks AmeriCorps.

For more information about Bear Brook or other state parks, call the N.H. Division of Parks and Recreation at (603) 271-3556 or visit www.nhstateparks.org.



READING continued FROM page 1

the history of a site. Trees do provide clues to forest history. As a budding Sherlock Holmes, you’ll want to recognize patterns of change and ask the right questions to solve the mystery. When you walk in the woods, read as you go. Stop and ask yourself, what species of trees are these? Are they early, sun-loving or late, shade-tolerant trees?

Forest age and species composition help date how recently the last disturbance occurred. The sun-loving “pioneer” trees – paper birch, poplar, pin cherry and pine are the earliest stage in a tree relay race called “succession.” The shade-tolerant trees – hemlock, spruce, sugar maple, beech and yellow birch – are forests that follow preceding forests, and are able to grow in the shade.

Often forests whisper tales of previous land use or history and disturbances. Natural disturbances can include hurricanes, winter gales, ice storms, fires, floods, insect pests or beaver activity. Human disturbances can include farming and logging activities, which are very common across the New Hampshire landscape. Examples of clues to previous land uses include stone walls,

barbed wire and apple trees, junipers and crooked “weevil pines” growing in former pastures. Logging history is indicated by cut stumps, skidder trails, wounds on bumper trees and a missing age-class as older trees were left and young seedlings and saplings crowded into a clearing created by logging.

More rarely, forest composition directly reflects pure site preferences related to slope, solar aspect and drainage characteristics. Examples include red maple wetlands, beech on dry hillsides, oak and hickory on south-facing slopes, sugar maple on moist, rich sites, pine on dry sandy sites or ledges and spruce at higher elevations on shallow, acidic soil. Topography and soils can limit competition so certain trees win by default, one more detail to consider in reading the forest’s story. Examples include hemlocks growing in a cool ravine, black spruce in an acidic bog or sub-alpine forest at tree line, or arching silver maples that colonize the shifting sands of riverbank floodplain forests.

It’s fair to say that most often, a combination of both disturbance history and site preferences shape the forests that we see today.



Reading the Forested Landscape

I got launched in my new career as a forest detective after taking a course called New England Plant Communities at Antioch New England Graduate School. It was taught by ecologist Tom Wessels, author of *Reading The Forested Landscape* (copyright 1997, The Countryman Press). Tom shared amazing field sites during the course, asking his students, “What happened here?” and “How do you know?” With easy answers, he’d then ask, “What about before that?” and sometimes, “What about before even that?” We found hurricane pits and mounds from the wind-thrown pines dating to the Great 1938 Hurricane, predated on the same sites by pits and mounds dating from hurricanes in the 1800s and 1700s – still visible in contemporary forests. Once for once, *Reading The Forested Landscape* is one of the best ways to get started finding clues and reading forested landscapes in your own favorite haunts. ~ Dave Anderson



Stories in Stone

You have seen them scattered through the woods, sitting in a field or maybe even in the middle of someone's yard. Where do these big rocks come from? They are huge and sometimes there isn't just one...but a group of them. You look around and there is no nearby cliff from which they could have fallen and rolled to their present location. You probably have also decided by now that the wind certainly did not roll the rock here either. Could a stream wash a rock that size? Although violently rushing streams are capable of rolling and pushing large rocks, stream flow circumstances have to be just right in order to do that, and there should be evidence of that stream around the rock.

So if it was not a stream, how do these big rocks "form in place?" That is, was it a large piece of the local bedrock (the crustal rock, that lies under the soil)? Weathering of exposed bedrock can leave a bedrock piece behind, but if that were the case, your boulder should be sitting on a rock surface of the same type of rock as your boulder. The rock surface and the boulder would both show signs of this weathering process. There have been enough times for this to happen in New Hampshire, because of the nearly continuous weathering and erosion

occurring since the break-up of the super-continent Pangaea, some 180 million years ago. New Hampshire's mountains at that time may have looked Himalayan-like. Today, we are looking at the deep insides of those mountains.

After New Hampshire's last Ice Age more than 1.2 million years ago, the Pleistocene Ice Sheet, flowed across New England, picking up the weathered rock and soil that was covering the land surface. All these loose pieces became frozen into the moving ice. This allowed the flowing ice sheet to act like a huge sheet of sandpaper, smoothing and rounding the rock surfaces caught in it. In some places, the ice began to slightly melt as it was forced over certain rocky surfaces. Melted water would then run into cracks in the bedrock and refreeze. As the ice sheet kept flowing, the frozen water in these cracks also went with it, "ripping" and plucking off pieces of the bedrock along the way. Some of these pieces were huge, but because flowing glacial ice is immensely powerful, it was able to carry them with it.

About 20,000 years ago, the Earth's climate began warming again, and the ice front "retreated" and melted northward, slowly withdrawing from North America.

As the front melted, all the loose soil, rocks and boulders once frozen into the ice were left behind. Smaller-sized rocks were washed from the land by the melting water. Large boulder pieces simply dropped or rolled out of the ice and were left on the land surface. It was the dropping of these large "plucked" boulders that left the big rocks we often find in our forests and fields today. Geologists call them "glacial boulders."

There are two types of glacial boulders. You can test your observation skills in order to tell which kind you're seeing. If the boulder is of the same rock type as the underlying bedrock, then it was probably not carried too far by the ice. This type of boulder is simply called a glacial boulder. The huge boulders in the Boulder Field at Pawtuckaway State Park, in Nottingham are probably glacial boulders. Most of them now rest on the same type of bedrock as their own composition.

If your big rock is of a different composition than the bedrock upon which it now rests, it is a "glacial erratic." The Madison Boulder, west of NH Route 113 in Madison, N.H., is an example of this. It is composed of Conway Granite and appears as though it was plucked from Whitten Ledge, which is made up of a similar Conway Granite. Whitten Ledge is located a little more than a mile to the northwest of where the Madison Boulder now rests at the Madison Boulder Geological Wayside Area. This resting area, however, is where the bedrock changes to Concord Granite, thus making the boulder a true glacial erratic. The N.H. Department of Resources and Economic Development reports that the Madison Boulder may be one of the largest intact (unbroken) glacial erratics in the world (visit www.nhstateparks.org/Parks/Pages/MadisonBoulder/MadisonBoulder.html).

So next time you come across what seems like a random large boulder in the middle of the forest, just imagine the stories it could tell! For more information about New Hampshire geology, visit the N.H. Geological Survey's website at www.des.nh.gov/geology or contact Lee Wilder at (603) 271-1976 or geology@des.state.nh.us.



New Hampshire schoolchildren gather in front of Madison Boulder, possibly one of the world's largest intact glacial erratics.

Article courtesy of Lee Wilder, Public Outreach Coordinator, NH Geological Survey

Who Goes There?

Whether we're out and about enjoying a walk in the woods, canoeing in a wetland, or picking berries at the edge of a meadow, seeing wildlife adds to our enjoyment of the day. Other than an occasional squirrel scolding us from a branch above or a bird alighting on a nearby perch, we are likely to only get a glimpse of a critter we've startled, bolting or scurrying off to the nearest cover. Our scent, pets and noise scares much of the wildlife off. Also, we are most apt to be active during the day, while wildlife is more active at dawn and dusk or during the night. More often, we have the opportunity to see the sign or evidence left by the wildlife that was there before us. Finding fur in the barbs of a fence, porcupine quills scattered near the entrance of a rock crevice, scat left on the forest floor, a bird nest or tracks in the mud at the edge of a pond can be nearly as exciting as seeing the animal itself.

The best places to find wildlife sign are areas where habitat types meet, or overlap, such as where a stream flows through a forest or field; or where the forest borders a meadow or wetland. Those overlapping

areas, or edges, are where wildlife diversity is normally the greatest.

Tracks are one type of sign that reveals the presence of wildlife. The best time of year to look for tracks is winter. When snow covers the landscape, the tracks and patterns of movement are most apparent. When there's no snow, the best places to find tracks are in the mud or wet sand near streams, rivers, lakes and ponds. Those are also good places to look for scat or droppings left by animals. Scat not only lets us know what animal passed by, but often gives clues as to what it had eaten. For example, bear scat left in the fall may be loaded with apple skins and seeds; and coyote scat found in winter may be filled with the white fur of a snowshoe hare. It's certainly worth a closer look than most of us want to give it.

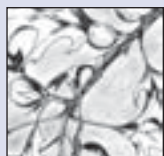
Some examples of other sign to keep on the lookout for are small holes dug in the leaf litter, which may indicate that chipmunks have been active in the area; patches of bare earth where leaf litter has been disturbed may have been made by deer looking for beechnuts or acorns in the fall;

numerous stripped spruce cones and piles of seed remnants on the forest floor near the base of a tree are evidence of red squirrels in the area; and a patch of matted grass on a west-facing slope may be a place where a deer had recently bedded. Browsed vegetation may also give clues about the wildlife in an area. Deer have no incisors in the upper jaw, so when they browse, the thicker stems they bite off normally appear torn or ripped off, whereas snowshoe hare feeding on the same type of vegetation leave neatly sliced stems. Even the holes left in trees give clues as to the wildlife that made them. Pileated woodpeckers leave large holes in the trunks of trees in their search for insects, while downy and hairy woodpeckers leave much smaller holes. The holes left in trees by yellow-bellied sapsuckers are very small and arranged in close, neat rows.

Wildlife is everywhere. Although, we don't often get a chance to view it as we'd like, we can always find evidence that it's all around us. How are your observation skills?



by Mary Goodyear, Project WILD



Oak apple galls: Oak apple galls are an abnormal growth of plant cells, formed by the tree in response to a certain wasp that lays its eggs between the layers of its

leaves. The developing larvae live in the gall and eat from it until they reach the adult stage, when they emerge through a small exit hole that you can often see. Galls come in all shapes, colors, and sizes, and can be found on leaves as well as plant stems. Oak apple galls do not usually harm oak trees. In spring, oak apple galls are green, but after the wasp leaves, the gall dries out and becomes brown.



Bark beetle trails: Many insects chew trails in wood beneath the bark of trees. To find these kinds of trails, you can pull up the bark on a dead branch or log and see

the maze of tunnels that have been made there. The trails shown here are created by a kind of bark beetle. Bark beetles live and feed underneath the tree's bark. The adults bore through the bark, mate and lay their eggs. When the eggs hatch, the larvae then begin feeding on the inner bark and leave behind their feeding trails.

1-Minute Forest Mystery Solutions

Erin Walsh, Project Learning Tree



Middens: Seeds from many conifer trees are ideal winter food source for many small mammals, such as squirrels. Squirrels eat large quantities of these seeds, often eating in the same spot many times. Sometimes in the forest you can find a large pile of empty cone husks and scales left in a pile, usually at the base of a tree. This is called a "midden" and when you find one, you know a squirrel has been there.



Porcupine sign: Porcupines are vulnerable to starvation in winter and rely heavily on plant cambium under tree bark to survive these coldest months of the year. They prefer hemlock trees, but they will feed on other trees as well. Often you can see evidence of porcupine activity by carefully observing the tree's trunk and looking for signs of chew, as pictured here.



Yellow-bellied sapsucker holes: Horizontal lines of quarter-inch holes are a good sign that a yellow-bellied sapsucker has been here. The yellow-bellied

sapsucker is a specialized woodpecker that eats sap dripping from holes it has systematically drilled into tree trunks. Its habit of making these shallow holes in trees to get sap can also attract insects and other bird species like hummingbirds to the tree.



Beaver Sign: Downed trees on the edge of a pond can be an obvious sign of beaver activity. They use their long incisor teeth to cut down trees, gnawing all the way

around the tree trunk. Oftentimes, beaver tracks in the mud are covered over by the dragging tracks of trees, or sometimes even by their own tail! The beaver helps to write the story of forest succession. Overtime, a beaver pond will become a meadow, and then shrubs begin to grow. The shrubs provide shade that allows tree seedlings to get started. Once these trees grow tall enough, they will shade out the shrubs. The trees will eventually grow into a mature forest.

A Forest For Every Classroom

The Forest for Every Classroom program educates middle and high school teachers in New Hampshire about forest stewardship issues and provides them with tools to develop curricula that meet the state's educational standards and can be implemented using their local landscape, resources and community for real-world teaching. Graduate credits are available from PSU. This is a year-round professional development opportunity and begins August 2-3 and 7-9 at the Hubbard Brook Experimental Forest, Woodstock, N.H. Other dates include October 12-13, 2007, February 2008 (dates TBA) and May 2008 (dates TBA). For more information visit www.nhplt.org or contact Erin Walsh at (603) 226-0160.

The Nature of Science: Unleashing the Scientist Within

This 5-day professional development workshop for teachers introduces participants to the concepts of the nature of science and the skills involved in becoming a scientist. Topics include inquiry skill strategies, data collection and its use with natural resources, including wildlife and water resources, using forests as inspirations in science, formative assessment ideas and much more! Participants will engage in discussions with education specialists, natural resource professionals and hands-on activities from Project Learning Tree, Project WET and Project WILD. The workshop will run June 25-27 and July 11-12, 2007, in Concord. Three Graduate Credits are available. For more information and registration visit www.des.nh.gov/wet/wetsched.htm or contact Robin Knight at (603) 206-6816 or email rknight@seresc.net.

Watershed Ecology Institute: Summer Course for Science Teachers

Two-week course (Monday - Friday) offered July 23-August 3, from 8:30 a.m. to 4 p.m. at Bow High School. The Watershed Ecology Institute is an undergraduate and graduate-level summer program and can offer continuing education credits for teachers, licensed foresters and certified wetland scientists. It also provides core training for teachers who want to participate in the Watershed Education Program offered by New Hampshire Fish

and Game, a program closely aligned with the N.H. Science frameworks. Coordinated by Fish and Game staff, with technical support from UNH Cooperative Extension, N.H. Department of Environmental Services and other professionals. Each day focuses on a particular aspect of watershed ecology and offers hands-on techniques for applying science in real-world situations. The course can be taken for 2 credits from the UNH Division of Continuing Education or as a non-credit course. Contact Judy Tumosa, Fish and Game Aquatic Resources Education Coordinator, at (603) 271-0456 or email judy.l.tumosa@wildlife.nh.gov.

Curriculum Connections Through Schoolyard Investigations

This 5-day professional development institute for educators of grades K-8 is focused on investigating New Hampshire's rich natural landscape while developing your professional skills. Learn science content through study of the state's natural resources and landscape, explore skills and techniques to teach content to K-8 classes through problem-solving and inquiry-based schoolyard investigations and design an interdisciplinary investigation suited to the scope and sequence of your curriculum, incorporating the new science frameworks. The institute will be held at the Urban Forestry Center, Portsmouth, N.H., on August 14-16 and 20-21, 2007. Four Graduate Credits are available. All meals, instruction, manuals, and other materials for Projects WET, WILD, Learning Tree, and Homes for Wildlife are included in the \$200 registration cost. Brochure available at www.nhplt.org. For more information, contact Jennifer Bourgeault at GLOBE at (603) 862-4178 or email nheet@comcast.net.

Environmental Pathways in the Classroom

October 20, 2007, from 9 a.m.-5 p.m. at the Owl Brook Hunter Education Center, Holderness. This workshop will introduce pre-service and in-service, formal and nonformal educators to the award-winning curriculum materials of Project Learning Tree (PLT), Project WET and Project WILD. These programs are designed to take forests, wildlife and water and make them real for preK-12 students. Activities are easily infused into everyday school subjects and busy classrooms. Workshop fees are \$50 for pre-service teachers and \$75 for in-service teachers. For more information, contact

Erin Walsh at (603) 226-0160 or email info@nhplt.org.

PLT Resources Available Online

Are you looking for supplemental resources for activities in the PLT PreK-8 Guide? Printable student pages, technology connections, stories, charts, illustrations, and more are available at www.plt.org. Click on "Curriculum," then "PreK-8 Guide."

Children's Literature and PLT

Are you looking for children's literature to supplement a PLT activity? Would you like to find a PLT activity that correlates to a specific book you're reading? This is the website for you! Visit www.plt.org. Click on "Curriculum," then "PreK-8 Guide."

Interactive Lake Ecology Curriculum

Do you teach about lakes and ponds? Check out the N.H. Department of Environmental Services Interactive Lake Ecology Curriculum. Visit www.des.nh.gov/wmb/ILE or contact Alicia Carlson at (603) 271-0698 or e-mail acarlson@des.state.nh.us for more information.

NALMS 2008 Lakes Appreciation Month Poster Contest

Students in grades 4-8 are eligible to participate. The student winner will have their poster displayed throughout the country on the 2008 NALMS Lakes Appreciation Month poster and will receive at \$100 cash prize. The school that the winner attends will receive a \$500 cash prize to use towards materials related to lake ecology.

Posters should focus on any lake and watershed issues, and may include topics such as pollution, aquatic invasive species,

ANNOUNCEMENTS cont. on page 8

RESOURCES

- Gibbons, Diane K. *Mammal Tracks and Sign of the Northeast. Lebanon, N.H.: University Press of New England, 2003.*
- Rezendes, Paul. *Tracking and the Art of Seeing: How to Read Animal Tracks and Sign. New York: Harper Collins Publishers, Inc., 1999.*

ON THE H.O.M.E. FRONT

A Tale of Plants, Bedrock and Soils:

What Grows Where, and Why?

by Marilyn Wyzga

Plants don't stand on their own. They are a part of ecological systems – ecosystems – in which they establish, grow and reproduce. They are rooted in the soil, from which they draw water and nutrients, and extend into the atmosphere that provides vital sunlight and gases.

Plants differ in their requirements for nutrients and moisture, and sites differ in their ability to supply these needs. Consequently, each species tends to be specific to a characteristic ecosystem(s). Using this knowledge, you can identify plant habitats by examining the topography and the soils that lie beneath the surface of your schoolyard.

The New Hampshire Landscape

Nearly 85% of our New Hampshire landscape is forested. Over human history, this landscape has been disturbed by fire, wind, agriculture and logging. In earlier eras, the powerful forces of glaciers shaped the landscape. Further back still in geologic time, the landscape was formed by bedrock, which gave rise to the first soils. All of these factors yield the forest types we see in the state today.

As you read in Dave Anderson's lead article, "Reading... While Hiking," our New Hampshire forests can be divided into six major regions: spruce-fir, found mostly in the White Mountains; northern hardwoods and northern hardwood-spruce combinations in northern and central areas; transition hardwoods-white pine in the Connecticut River valley and southeastern

New Hampshire; central hardwoods-hemlock-white pine in the southeast and coastal areas; and pitch pine-oak in the Ossipee barrens.

The various forest regions in turn yield different habitat types for wildlife. The distribution or mixing of vegetative types, size classes and other features largely determines the wildlife communities that occur in an area. More diversity in size classes and in the layering of different types of plants and growth forms (trees, vines, shrubs, herbs, mosses and lichens) yields more diversity in the wildlife species present.

Bedrock and Soil Form the Framework

Topography and substrate primarily determine plant community composition. Topographic slope exposes land to more or less sun, influencing its temperature and moisture. So a north-facing slope is cool and moist, and often grows with balsam fir and hemlock.

A much stronger impact is exerted by substrate, the mineral materials on which soil forms. The type and arrangement of plants mirrors the mixture of clay, silt, sand, glacial till and rock lying beneath them. These range from wet to dry, fine to coarse grained, neutral and nutrient rich to acidic and nutrient poor. Soils determine plant material by affecting the amount of water, nutrients and soil gases available.

Let's read the story of the Concord Heights to see these forces at work. In the woodlands around the N.H. Fish and Game headquarters in Concord, red oak, white pine and pitch pine dominate. Gray and paper birch and white oak appear in the next tier, while wintergreen and low-bush blueberry provide much of the groundcover. Sweetfern appears in the sunny margins. Pitch pine is a good indicator of the warmest, driest topographic sites in central New England; it is also a remnant of pine barrens, which, when not burned, revert to pine/oak stands. Sweetfern is a strong eco-indicator of sand and gravel. Disturbed sand or gravel substrates often colonize with gray birch, paper birch and white pine. Combined, these factors tell a tale of very sandy soils, common to the former pine barrens of the Merrimack River Valley. A visit to a Natural Resources Conservation Service (NRCS) soils map confirms that this area is

dominated by Hinkley/Windsor sandy soils types.

Glaciers Shaped the Soils

The pine barrens of the Concord area likely resulted from glacial activity. About 10,000 to 15,000 years ago, the land of New Hampshire emerged from the glacial age. Melting ice revealed dramatic changes in the landscape. Mountains were rounded off. Chunks of bedrock, picked up and dragged for miles, were left behind as the large glacial boulders we call erratics. The glaciers scraped soil off bedrock and compressed other soils with their massive weight. They gathered and dumped piles of sand and gravel, visible today as drumlins or moraines. These deposits, along with the melting ice, formed glacial lakes in which sediments gradually collected, forming new layers of soil. One of these lakes bordered the Concord Heights and likely deposited the sands on which the pine barrens eventually grew.

Wildlife common to the pine barrens include over 700 species of moths and butterflies, several of which are rare. Perhaps the best known is the endangered Karner blue, our state butterfly, whose larvae feed exclusively on the wild lupine that thrives in the sun and sand of the pine barrens. This plant community includes unique plants, like spreading dogbane and blunt-leaved milkweed, and also supports less-common wildlife like northern harriers, hognose snakes, Fowler's toads and nighthawks.

Plant Communities in Your Schoolyard

You can apply this study to your schoolyard habitat enhancement plans. Find the story in your schoolyard as you take inventory of your school grounds. Look at the types of plants growing there, especially in wooded areas. Explore the surrounding natural communities for the dominant, secondary and eco-indicator plant species. Use soils maps, geology maps, aerial photographs and other resources to help you determine what types of plant communities your site naturally supports and will support (some of these resources are listed below). Use these clues to shape a new story for your schoolyard, one rich in plant and animal diversity.

HOME continued on next page

RECOMMENDED READING:

- *Reading the Forested Landscape*, Tom Wessels, The Countryman Press, VT, 1997
- *Why Trees Grow Where They Do*, by Bill Leak and Jane Riddle, on the USDA Forest Service website at www.fs.fed.us/nal/durham/coopforest/stewardship/text/whytrees.shtml
- *New England Wildlife: Habitats and Distribution*, Richard DeGraaf and Mariko Yamasaki, University Press of New England, Hanover, 2001
- NH Geologic Survey - www.des.state.nh.us/asp/Geology/links.asp
- NH Geology on the World Wide Web - <http://kilburn.keene.edu/GSNH/NHgeol.html>



ANNOUNCEMENTS cont. FROM page 6

aquatic life, aquatic plants, lake ecology and lake health. Posters should be no larger than 18 inches by 24 inches, and created in a style that is easily reproduced (i.e., crayon, watercolor, colored pencil or marker).

Please include the student's name, school, teacher's name and school contact information on the back of the poster. Posters must be received by the NALMS Education Committee no later than October 31, 2007. Please send posters to Amy Smagula, NHDES, 29 Hazen Dr, Concord, NH 03301. For more information, please contact Amy Smagula at (603) 271-2248, e-mail asmagula@des.state.nh.us or visit www.nalms.org.

Great American Secchi Dip

The Dip-In is a chance for lay people to take a water clarity measurement from a local lake, using a secchi disk. The dip-in goes from June 23 to July 15. Disks can be borrowed from the N.H. Department of Environmental Service (DES) or most local colleges or universities. To reserve a secchi disk from DES, please contact Amy Smagula at (603) 271-2248. For more information, please visit dipin.kent.edu or contact Jody Connor at (603) 271-3414.

2007 New England EE Conference in Maine

Reserve the weekend of September 14-16, 2007, for the 41st Annual New England Environmental Education Alliance conference at Camp Matoaka in Smithfield, Maine. This year's conference is titled, Building Bridges – Creating Change for a Common Good. The event offers numerous EE-focused workshops and networking opportunities. Visit www.neeea.org this summer for information and registration materials.

Changing Minds: The Lasting Impact of School Trips

This research looked at the longer-term impact of out-of-classroom learning experiences on knowledge, attitudes, behavior and decisions and choices children make. Researchers found that high quality out-of-classroom learning influenced how children behave and the lifestyle choices they make, demonstrating the potential for schools trips not just to change children's lives, but the lives of whole communities. The complete study results are available online at: www.nationaltrust.org.uk/main/w-schools-guardianships-changing_minds.pdf.



Coordinator Information

Mary Goodyear
Project WILD

N.H. Fish and Game Dept.
1450 Route 3 North
Whitefield, NH 03598
(603) 419-0256 or
(603) 271-3211
mgoody@ncia.net
www.wildlife.state.nh.us

Jessica Morton
Project WET

N.H. Department of
Environmental Services
29 Hazen Drive
Concord, NH 03301
(603) 271-4071
wet@des.state.nh.us
www.des.nh.gov/wet

Esther Cowles
Project Learning Tree

54 Portsmouth Street
Concord, NH 03301
(800) 677-1499
info@nhplt.org
www.nhplt.org



PRSR STD
U.S. POSTAGE
PAID
CONCORD, NH
PERMIT #726

NH Project Learning Tree
54 Portsmouth St.
Concord, NH 03301

